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## STUDIES IN LIFE HISTORIES OF NORTH AMERICAN LEPIDOPTERA CALIFORNIA ANNAPHILAS

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*Del Mar, California and Pearblossom, California*

THE MOTHS KNOWN AS ANNAPHILAS have intrigued many lepidopterists since Grote erected the Genus in 1873. This interest is partly due to the limited range of its components. They extend from British Columbia through the western states of Washington, Oregon, Nevada, California, Idaho, Utah, New Mexico, Arizona, and Texas. Also study is stimulated by the rarity of many species, their distinctive coloration, and their diurnal habits.

In southern California several lepidopterists — Christopher Henne, Frank Sala, William H. Evans, Charles Hogue, and the late Claude I. Smith — avid collectors and resourceful field workers, have assembled notes on the biology and ecology of California species.

Frank Sala published a short paper in the *Lepidopterists News* (1950) chiefly on habits of the genus in general, with no specific reference to life histories. Only Claude Smith had prepared systematic notes on individual species in anticipation of their being published. When he died these notes were made available to Dr. Frederick H. Rindge. This led eventually to the publication in 1952, by joint authorship, of "A Revision of the Genus *Annaphila* Grote".

This work has increased our knowledge and stimulated our interest in the *Annaphilas*. In the introduction we especially noted: "There is a particular need for life history work, and the careful study of the early stages as an aid in the proper placement and relationships of this genus within the *Phalaenidae*." (Page 191)

Since Christopher Henne was collecting and rearing members of the genus, and Comstock was illustrating and recording the results of this work, it was decided that, in response to the recommendation of Dr. Rindge, our joint efforts should be published.

We shall include such additional notes on life histories as are available, particularly the work of William H. Evans as recorded in the Rindge-Smith "Revision."

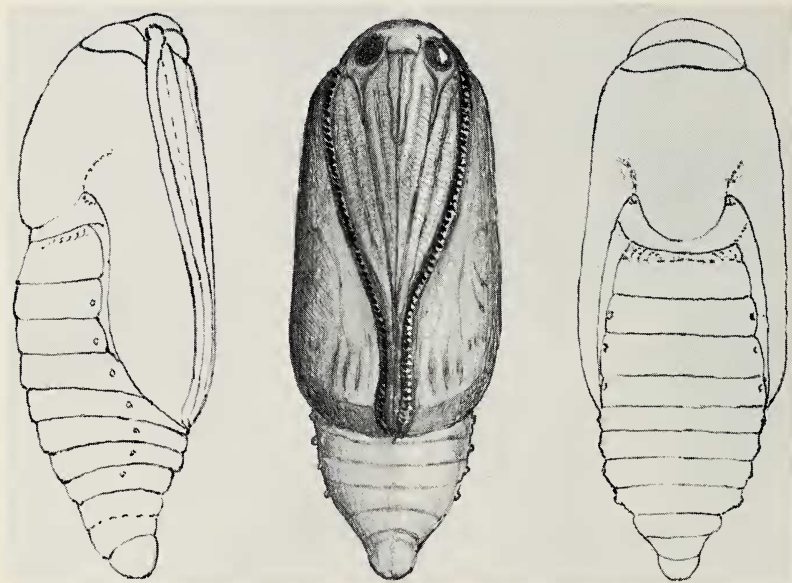


Fig. 1. Pupa of *Annaphila arvalis* H. Edw., lateral, ventral and dorsal view. X 10.

Our descriptions and illustrations are frequently based on individual specimens, and therefore do not describe variation within a given species.

### ***Annaphila arvalis* Henry Edwards**

This species was first taken in the "Sierra Nevada". It is not uncommon in southern California and ranges north into Oregon and Washington. The moth flies from January to April. Evans briefly described the third to fifth instar larvae; reported the food plant as *Montia perfoliata* (Donn) Howell; and stated that "pupation occurred inside hollow stems, but no attempt was made to seal the openings."

*Pupa:* (Fig. 1)

In 1956 Frank Sala sent us a pupa. The larva had been taken in "Latigo Canyon", Santa Monica, California. No date was recorded. An illustration was made and the following brief notes recorded.

Length, 7.5 mm.; greatest width, 2.8 mm.; head, well rounded; eyes, prominent; antennae, terminating at the margin of wings; spiracles, slightly protruding; terminal segment a round button with no cremasteric hooklets.

Ground color is light yellow-brown. The eyes, antennae, wing margins, cephalothorax and caudal tip are dark brown to black. A few buried dark spots occur across the central part of the wings, and light pencilings indicate some of the wing nervules.

Structural details not specifically mentioned are shown in the illustration. The mature insect is pictured in color by Hampson, (1910), in Vol. 9, and also by Draudt in Seitz, (1927), Vol. 7, Plate 47d.

### REFERENCES

- DRAUDT, M. 1927. (In Seitz). Macrolepidoptera of the World, American Noctuidiformes. 7. Pl. 47f.
- GROTE, AUGUSTUS R. 1873. Descriptions of Noctuidae Principally from California. VIII. Bull. Buffalo Soc. of Nat'l. Sciences, 1: 149-152, Pl. 4.
- HAMPSON, GEORGE F. 1910. Catalog of the Phalaenae in the British Museum. 9: 473-483. Pl. CLXVI.
- RINDGE, FREDERICK, and CLAUDE I. SMITH. 1952. A Revision of the Genus *Annaphila*, (Lepidopt. Phalaenae.) Bull. Am. Mus. Natl. Hist. Vol. 98: (Article 3), 187-256. 8 figs.
- SALA, FRANK P. 1950. Field Notes on Diurnal Moths of the Genus *Annaphila*. Lepid. News: 4: 71.

### *Annaphila abdita* Rindge and Smith

This species is on the wing from February to April. It is recorded only from California. No previous data on its life history are available.

A number of eggs were secured from a confined female, taken in the Santa Monica Mountains, Los Angeles County, (elev. 900 ft.) on March 19, 1963. These hatched April 1, 1963.

*Egg*: (Fig. 2 A)

Width, 0.5 mm.; height, 0.4 mm.; form echinoid. The base is slightly flattened, and the micropylar depression relatively large. When first laid, the color is straw and prior to hatching it turns grayish. The surface bears from 23 to 29 ridges, running from base toward micropyle. Approximately 15 of these reach the margin of the micropylar depression. The others become obsolescent or fuse with their neighbors. The ridges are slightly irregular and each bears a line of small knobs along its crest.

We were unable to record the early instars, but on May 14 drawings and notes were made.

*Mature larva*: (Fig. 2 B)

Length, 14 mm.; head width, 2 mm.

Head ground color is light creamy brown, with a slight tinge of yellow. The adfrontal sutures are distinct and spotted with pinkish dots. The ocelli and mandibles are black, and the antennae

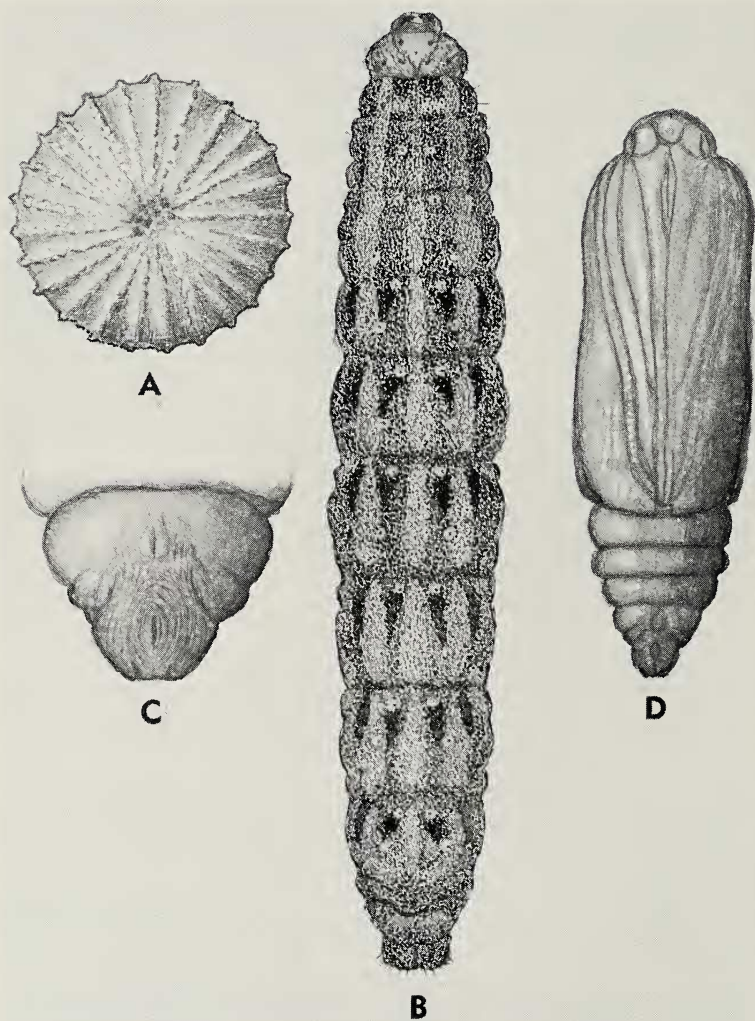


Fig. 2. Egg, larva and pupa of *Annaphila abdita*. A. Egg, superior aspect, X 65. B. Mature larva, dorsal aspect, X 9. C. Caudal segment of pupa, ventral aspect, X 33. D. Ventral aspect of pupa, X 11.

Reproduced from water color drawing by J. A. Comstock.



are yellow-brown. Lines of brown dots across the cheeks and extend from crown to lower margins.

The body ground color is light cream, heavily obscured by bands of speckled blackish brown and dull pink. There is a mid-dorsal band of dull pink made up of pink dots on the cream base. This is narrow at the cephalic end and gradually widens. It is, however, pinched in at each segmental juncture. A similar but more distinct band runs dorso-laterally. A still wider band of the same character runs stigmatally, the spiracles occurring along its upper edge. The latter are black-centered with very narrow rims. Below the stigmatal band, the body is spotted with brown dots on a light brown base, the latter fading to a still lighter brown on the venter.

The legs are translucent light brown with darker tips. The prolegs are spotted with brown proximally and are translucent creamy brown distally. The crochets are brownish black.

The dark areas running between the dull pink spotted bands owe their heavy color to a thick sprinkling of brown-black dots over their surfaces. This is relieved on each segment by a pair of white circlets surrounding minute black centers, each of which bears a small black seta. Setae of this character occur elsewhere on the body but are difficult to discern without high magnification.

*Pupa:* (Fig. 2 D)

Length, 7 mm.; greatest width through center, 2.5 mm.

The color is chrome-yellow, slightly translucent. The surface texture is smooth and glistening, except for a portion of the last caudal segment. (See Fig. 2 C)

The head is well rounded and eyes are not prominent. All sutures are faintly visible. The maxillae reach almost to the wing margins and the antennae terminate 0.3 mm. short thereof. The spiracles are light brown.

The ventral surface of the last caudal segment is sub-ovate, slightly flattened, and ridged around a central cleft. There are no cremasteric protrusions or hooklets.

The food plant of the species is *Montia perfoliata* Howell. Pupation occurs underground in a compact cocoon.

***Annaphila baueri* Rindge and Smith**

This species, named for William R. Bauer of Petaluma, was taken at Anderson Springs, Lake County, California and also 4 miles west of Glenbrook, Lake County.

Its period of flight is from February to April.

It is known to occur only in California.

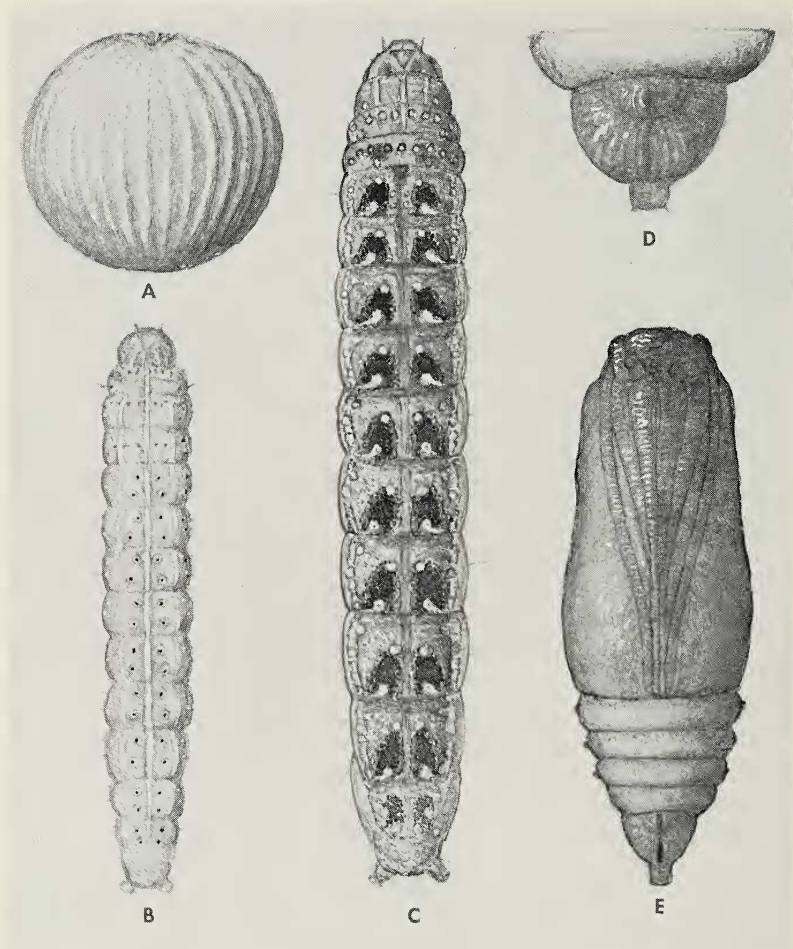


Fig. 3. Egg, larva and pupa of *Annaphila baueri*. A. Egg, lateral aspect, X 60. B. Intermediate instar larva, dorsal aspect, X 12. C. Mature larva, dorsal aspect, X 8. D. Cauda and cremaster of pupa, ventral aspect, X 8. E. Pupa, ventral aspect, X 8.

Reproduced from water color drawing by J. A. Comstock.

Eggs were collected at Cedar Pines Park, San Bernardino Mountains, (elev. 5200 ft.) from the underside of leaves of *Nemophila* sp. The plant was subsequently determined by Dr. Reid Moran as *Nemophila Menziesii* ssp. *integrifolia* Munz. An additional locality for the species is La Tuna Canyon, Los Angeles County.

*Egg: (Fig. 3 A)*

Globular; width, 0.4 mm.; height, 3.8 mm.

The color is light yellow with a slight tinge of light green. Numerous ridges run from the base to the micropylar area. There are approximately 30 of these ridges, but many fuse with others or become obsolescent as they approach the micropyle. The ridges are irregularly nodular along their edges, and the valleys between them are not crossed by horizontal lines. The micropyle is minute and deeply depressed.

Eggs collected April 20, 1963, hatched April 27.

*First instar larva:*

Body length not recorded; head width, 0.25 mm.

The color of head is black, or greenish black, wider than the first segment. The body is pale translucent green. The legs are tinged with light brown, the prolegs are colorless, with brown crochets.

Many minute and colorless setae are scattered over the body, arising from colorless nodules.

*Intermediate instar: (Fig. 3 B)*

The color of head is yellow-green, covered with numerous red-brown dots which are thickest in the middle areas of the cheeks above the black ocelli. The mouth parts are also tinged with red-brown.

The body is deep green throughout. There is a suggestion of a paired dark green longitudinal middorsal stripe.

Numerous white papillae occur on each segment. These are topped by black points and bear very short colorless setae.

The legs are translucent light green, as are also the four pairs of prolegs and the anal pair. All prolegs are sprinkled with black dots.

The example above described moulted May 22, 1963.

*Mature larva: (Fig. 3 C)*

Length, 13 mm.; width, through center, 3 mm.; head width, approximately 1.5 mm.

The head is soiled-yellow, mottled and spotted with black. The ocelli rest on a lighter ground, superior to which is a large brown area. The front is heavily spotted around the margin. The antennae are white.

The body is heavily mottled with brown and black spots and dashes, darkest on the dorsum and lighter below the spiracular area and on the venter.

The first thoracic segment has a narrow middorsal white stripe with a wider stripe on each side of it. The second and third seg-

ments have transversely placed rows of white spots, each ringed with black, and bearing short white setae. On the remaining segments each has a pair of comma-like white dashes on the posterior margin, one on each side of the middorsal area. Anterior to each of these is a large black triangular patch with a white dot at its apex.

Stigmatically there is a broken white wavy line. Many white dots are scattered regularly over the body surface, each apparently bearing a short white seta. The legs and prolegs are mottled brown and black on a gray ground.

Pupation occurs underground in a compact oval cocoon formed of tough fibers, completely covered by a layer of adherent granules of earth, small pebbles, and debris. The average cocoon measures 13 mm. by 8 mm.

*Pupa:* (Fig. 3 E)

Length, 9 mm.; width through center, 3.4 mm.

The color is wood-brown, with portions of the head and cauda nearly black.

The surface texture is predominantly rough, due to minute wavy ridges over the head, thorax, appendages and wing cases. The abdominal segments lack these ridges, but are slightly roughened, and the anterior edge of each movable segment is pitted.

The spiracles are elevated, and dark brown. The maxillae and antennae reach to the margins of the wing cases.

The last caudal segment is hemispherical on its ventral aspect, and is regularly ridged as is shown in Fig. 3 D.

The cremaster is a small cuboid knob, slightly pointed at its two outer tips, and lacks spines or hooklets.

### ***Annaphila astrologa* Barnes and Benjamin**

The type locality of this species is Redington, Arizona, but the majority of recorded captures are from the southern portion of California. The insect is on the wing in February, March, April, and July. The July records suggest an abortive second brood.

Larvae were taken in Aliso Canyon, San Gabriel Mountains, (elev. 3200 ft.), Los Angeles County, and in Red Rover Canyon, southwest of Acton, Los Angeles County, (elev. 3200 ft.) in May 1963. We have not seen examples of the ovum which is yet to be described.

The food plant is (flower buds of) *Emmenanthe penduliflora* Benth.



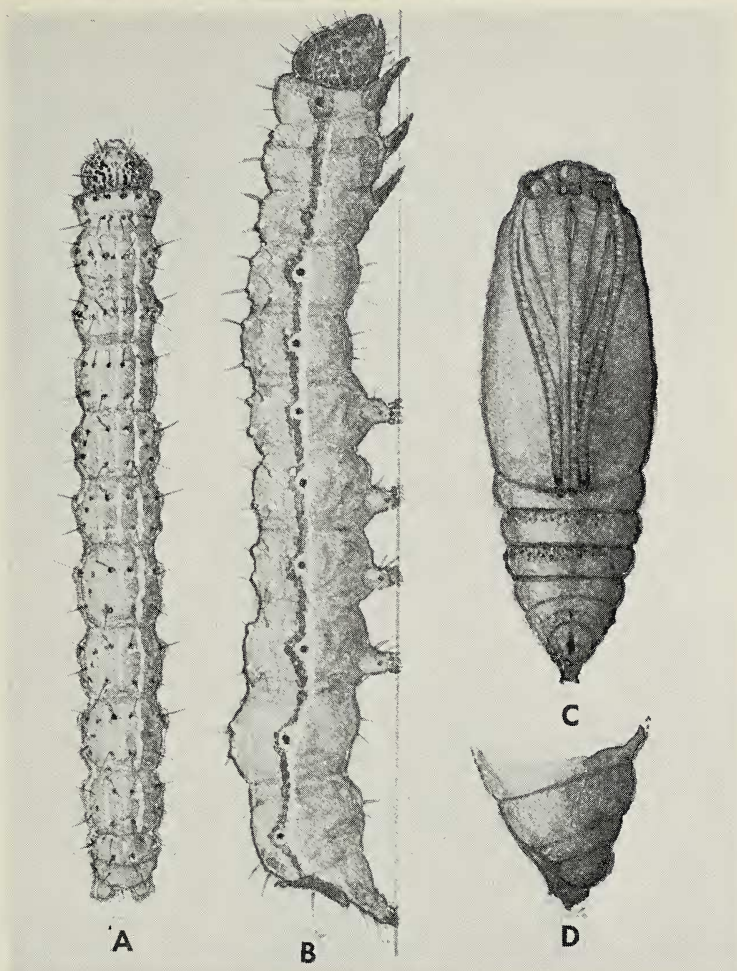


Fig. 4. Larva and pupa of *Annaphila astrologa*. A. Intermediate instar larva, dorsal aspect, X6. B. Mature larva, lateral aspect, X4. C. Pupa, ventral aspect, X6½. D. Cauda and cremaster, lateral aspect, X18.

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*Intermediate instar larva:* (Fig. 4 A)

Length, 16.5 mm.; width through middle of body, 2 mm.; width of head, 1.5 mm.

The head is glistening yellow, spotted with brown. The ocelli are dark brown.

The body ground color is clear green. There is a very narrow middorsal white stripe, margined with dark green. A similar stripe parallels this on each side dorso-laterally. There is a raised stigmatal wavy white line.

The spiracles are brown-centered with white circlets. The legs are green proximally, shading to brown on the tips. The prolegs are green with brown crochets. The venter is green. There are numerous white setae scattered over the body, each arising from a minute brown point resting on a white circlet.

*Mature larva:* (Fig. 4 B)

Length, 28 mm.; body width, 3 mm.; head width, 1.75 mm.

The ground color of the head is dull yellow. It is heavily sprinkled with brown dots. The mouth parts are darker, and the ocelli white.

The body ground color is uniform green. There is a paired longitudinal middorsal line of dark green, formed partly of dots and dashes. In the center of this line there are spots of a lighter green. A faint suggestion of a dorso-lateral whitish line is present.

Stigmatically there is a wide sinuous band of spotted dark purple and white, bordered inferiorly by white. The dark-centered spiracles are ringed with white, and are in contact with the marginal white line on their lower edges. The venter is green, the legs spotted with brown, and the prolegs green with brown crochets.

It is noted that there is little difference between the intermediate instar and the final, whereas in several other species there is strong contrast.

In captivity the larvae pupated on the floor of the rearing cage underneath pieces of bark in an oval cocoon formed of soil particles and silk adherent to the bark.

*Pupa:* (Fig. 4 C)

Length, 10 mm.; width through center, 3.5 mm.

The color is predominantly deep brown, with the thorax shading to black. There is a middorsal longitudinal black band. The minute quadrate cremaster is also black.

The head, thorax, and appendages are finely rugose or minutely ridged. Most of the abdominal segments are smooth, but the movable segments are pitted along their anterior margins. The maxillae extend to the wing margins, and the antennae terminate 0.75 mm. short thereof.

The cremaster shows more clearly on lateral aspect (see Fig. 4 D). It bears minute spurs on the corners, but no hooklets.

### ***Annaphila ida* Rindge and Smith**

This species is thus far reported from the type locality, Chileo Creek area, San Gabriel Mountains, Los Angeles County, elevation 5700 to 5800 ft., and from Sierra Pelona Valley, Los Angeles

County, elevation 3400 ft., Mt. Pinos, Kern County, elevation 8000 ft., Cedar Pines Park, San Bernardino County, elevation 5200 ft. and Horse Flats, San Gabriel Mts., Los Angeles County, elevation 5900 ft.

It was named for the widow of Claude Smith.

Christopher Henne obtained eggs on May 11, 1963 on the under side of basal leaves of *Phacelia curvipes* Torrey. They hatched shortly before May 21, while in transit. Drawings had to be made from the empty shells. The larval exit was cut through the side of the egg, and the shell was left largely intact.

*Egg:* (Fig. 5 A)

Spherical, with slight flattening of the base; average diameter, 0.5 mm.

The color is reported to be straw.

The surface is crossed by ridges arising at the base, and terminating at or near the micropylar area. There are from 33 to 39 of these ridges. Their edges are studded with minute pearl-like knobs. There apparently are no cross striations running between the ridges. The shells showed no definite micropyle, and very little depression at the top of the egg.

*First instar larva:*

Length, 2.6 mm.; head width, 0.4 mm.

The head is black, and the body a uniform light green, with a small black cervical shield on the first thoracic segment and a transverse black dash over the dorsum on the 12th segment.

The legs shade to gray at their tips, and the prolegs are concolorous with the body.

*Mature larva:* (Fig. 5 B)

Length 13.5 mm.; head width, 1.5 mm.

The head is yellow, heavily sprinkled with blotches of brown. The antennae are pink, and the ocelli black.

The body ground color is cream. A narrow cream-colored mid-dorsal stripe margined with pinkish-brown runs the length of the body. Its margin forms the inner edge of a broad longitudinal band, made up of dots and dashes of light brown and cream. Lateral to this is a creamy band, lightly sprinkled with small pink dots. Latero-inferior to this is a suprastigmatal band formed of dots, dashes, blotches, and wavy lines of pinkish-brown, with the spiracles placed along its lower margin. The spiracles are black-centered, with circlets of cream-white. A broken longitudinal wavy line runs below this, fusing into a wide area of mottled cream and brown which extends downward to the line of the prolegs.

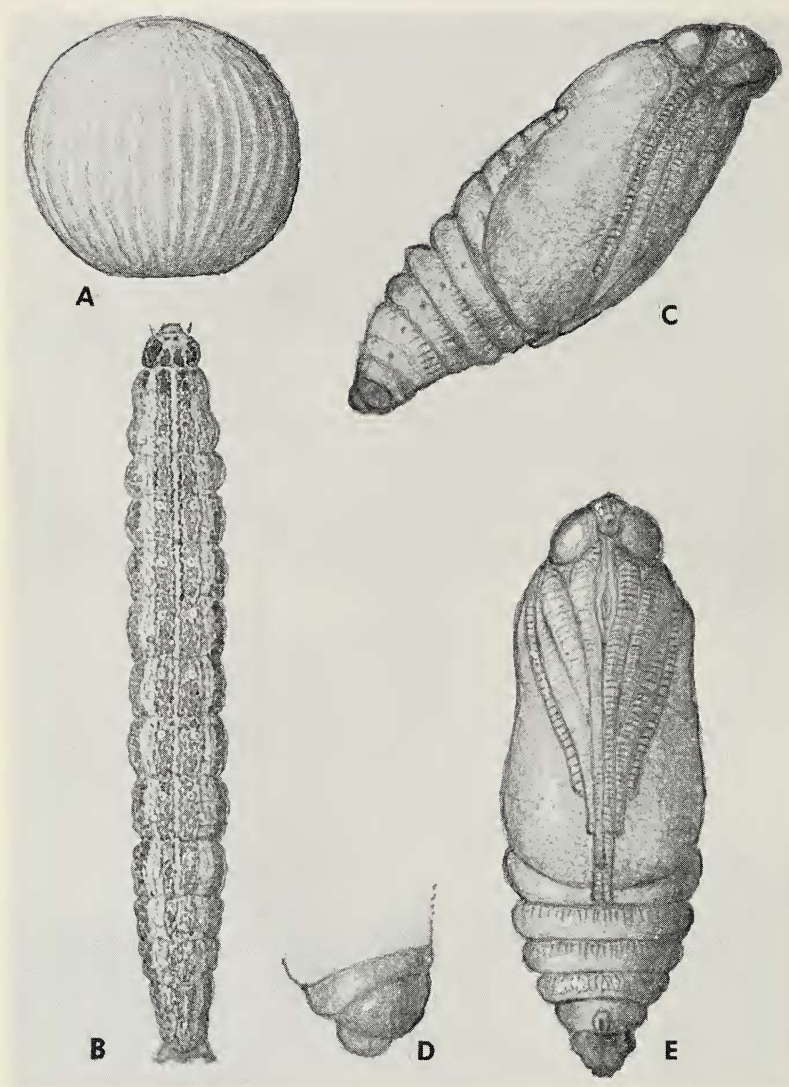


Fig. 5. Egg, larva and pupa of *Annaphila ida*. A. Egg, lateral view, X 70. B. Mature larva, dorsal aspect, X 7. C. Pupa, lateral aspect, X 9. D. Cauda, lateral aspect, X 22. E. Pupa, ventral aspect, X 9.

Reproduced from water color drawing by J. A. Comstock.



The venter is yellow-cream except on the thoracic area, where it has a tinge of green. The legs are translucent mottled cream and brown. The prolegs are cream with a delicate pink mottling. The crochets are brown.

Numerous short white setae occur on the body, but they are so small as to be practically indistinguishable without a lens. Each seta rests on a white or pinkish-white circlet with a minute black center.

*Pupa:* (Fig. 5 C to E)

Length, 8 mm.; greatest width through center, 3 mm. The form is robust, with an evenly tapering abdominal-caudal area, a relatively large head, and prominent eyes.

The color is dull green on the head and thorax, shading into a dull ochre-brown on the wing cases and abdomen. The green gradually fades with age. The caudal tip is nearly black.

Most of the surface is covered with minute transverse wavy ridges, those on the appendages being most prominent. The abdominal segments are partly smooth, but the anterior half of each (more particularly the movable segments) is ridged longitudinally.

The last caudal segment is shield-shaped on its ventral surface. It is cleft in the center, and the surface is rough. The small cremaster is barely visible on this aspect, but shows laterally as a rounded knob.

(See Fig. 5D).

### ***Annaphila depicta depicta* Grote**

Rindge and Smith (1952) have established the type locality of *A. depicta* as "San Mateo County, California" rather than "Sonome" County, as stated by Hampson (1910).

The species flies in March and April, and ranges throughout most of California. It has also been reported from Yakima County, Washington.

Eggs were collected on the Mineral King Road, east fork of the Kaweah River, Tulare County, elevation 3200 ft., on May 3, 1963. They were found on the under side of leaves of *Nemophila pulchella* Eastwood. Young larvae later accepted *Nemophila menziesii* var. *integrifolia* Munz.

*Egg:* (Fig. 6 A)

Globular; width, 0.48 mm.; height, 0.32 mm.

In form it is very similar to the ovum of *Annaphila baueri*. It differs in color which is pearly-white (slightly tinged with yellow). There are from 28 to 30 ridges running from base toward

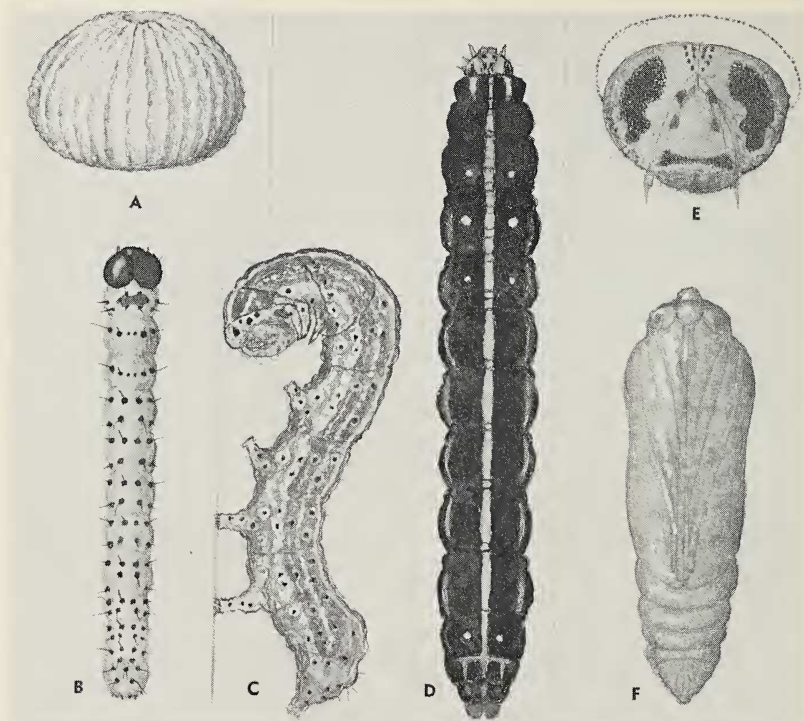


Fig. 6. Egg, larva and pupa of *Annaphila depicta depicta*. A. Egg, lateral aspect, X 50. B. First instar larva, dorsal aspect, X 22. C. Intermediate instar in resting attitude. D. Mature larva, dorsal aspect, X  $3\frac{1}{2}$ . E. Head of mature larva, X 6.

Reproduced from water color drawing by J. A. Comstock.

micropyle. As with other eggs in this genus, the ridges tend to diminish in number as they approach the micropylar area. Each ridge is slightly knobbed along its edge. Apparently no horizontal striations occur between the ridges.

The base of the egg is slightly flattened, and the micropyle is not deeply depressed.

*First instar larva:* (Fig. 6 B)

Length, 2.5 mm.; head width, 0.25 mm.

Color of head, including mandibles, jet black. The body is deep green, except for the first thoracic and last three caudal segments, which are colorless. The first segment bears a brown cervical shield, shaped like two arrow points, joined at their bases.

Several longitudinal rows of black papillae occur on the body, each papillus mounting a white seta. On the 2nd and 3rd thoracic segments these are smaller, and run in line transversely across the segments.

The legs are tinged with gray, and the prolegs are concolorous with the body. The cauda is slightly tinged with gray. The venter is yellow.

*Intermediate instar:* (Fig. 6 C)

Length, 12 mm.; head width approximately 1 mm.

The ground color is dull yellow, with two large black spots on each side of the epicranial sutures and numerous small black spots on the cheeks.

The body color is predominantly olive-green above the spiracular area and mottled yellow and white below. The first thoracic segment has four large round black spots on its anterior margin and eight small black spots on its posterior edge.

There is a clearly defined middorsal white line margined with a wavy black stripe. Lateral thereto is a broad band of olive-green with a discontinuous longitudinal stripe running along its center. Inferior to this is a wide white stigmatal band with a broken narrow orange black band or series of spots coursing along its center. On the olive-green areas and also the lateral white areas there are numerous black papillae with white circlets at their bases. Each papillus bears a minute dark seta.

The legs are dull yellow with multiple black spottings. The prolegs and anal prolegs are yellow with relatively large black spots.

*Mature larva:* (Fig. 6 D)

Length, 23 mm.; width at 6th segment, 3 mm.; head width approximately 1.5 mm.

The head is yellow, with a heavy spotting of black on each cheek above the ocellar area. The ocelli are black on a light ivory-yellow ground. The mandibles are reddish-brown, and the antennae translucent. (See Fig. 6 E)

The body is predominantly velvety black, with a conspicuous orange-pink middorsal longitudinal stripe. The 3rd thoracic segment has a dorso-lateral small white spot. A larger spot of the same character occurs on the 4th segment, and another small spot is in line with the first two on the 5th segment. Still another similar spot occurs on the 11th segment.

A wide band of soiled orange heavily overlaid with black spots and blotches runs along the stigmatal area, the spiracles being located near its upper edge. Below this, and on the venter, the surface is mottled brownish-black. The legs and prolegs are similarly spotted. The crochets are pink.

On May 31, 1963 a larva which had moulted at the completion of its penultimate instar entirely consumed its cast-off skin.



In comparing larva of *Annaphila depicta depicta* with the description of the southern California race, *A. depicta morula*, as recorded by Evans in the Rindge and Smith Revision (1952), it is apparent that the larva of the northern race is distinctly different.

With *A. depicta depicta* pupation does not occur underground. Our larva followed the same habit as that described by Evans: cutting a channel in the pithy center of *Sambucus* stems, and using this protection in the place of a cocoon. Our single example pupated June 1, 1963.

*Pupa:* (Fig. 6 F)

Length, 9.7 mm.; width through center, 3 mm.

Color and texture, glistening red-brown.

The wings and thoracic appendages are translucent, allowing the underlying segmental junctures to show through.

The maxillae reach to the wing margins, and the antennae nearly so. The segmental lines are very narrow and indistinct. The eyes are relatively small, and a shade darker than the surrounding area. The cremaster is a low round knob, and bears no spurs or hooklets. The spiracles are small and inconspicuous.

The moth is illustrated in color by Hampson (1910), Pl. 147, fig. 9, and by Draudt in Seitz (1927), Vol. 7, Pl. 47c.

#### REFERENCES

- DRAUDT, M. 1927. (In Seitz). Macrolepidoptera of the World. American Noctuidiformes. 7. Pl. 47f.  
EVANS, WILLIAM H. 1949. The Lepid. News. 3 (7): p. 74.  
HAMPSON, GEORGE F. 1910. Catalog, of the Phalaenae in the British Museum. Vol. 9: 473-483. Pl. CXLVII.  
RINDGE, FREDERICK, and CLAUDE I. SMITH. 1952. A Revision of the Genus *Annaphila*. Bull. Am. Mus. Natl. Hist. Vol. 98: (Article 3), 187-256.

#### *Annaphila diva* Grote and *Annaphila evansi* Rindge and Smith

*Annaphila diva* is one of the few comparatively abundant species in the genus. It is widely distributed through California, Oregon, Washington, and British Columbia. Its period of flight is from March to July. Its food plant was first recorded by William Evans (1949) as *Montia perfoliata* (Donn) Howell, and the same author gives a description of the fourth and fifth instar larvae in the Rindge and Smith Revision (1952).

As with several other *Annaphilas*, it pupates in a small cocoon.

The moth has been illustrated in Hampsons Catalogue (1910) as text figure 299, in Holland's Moth Book (1908) on Pl. 29, fig. 20, and by Draudt in Seitz (1927) on Pl. 47f.



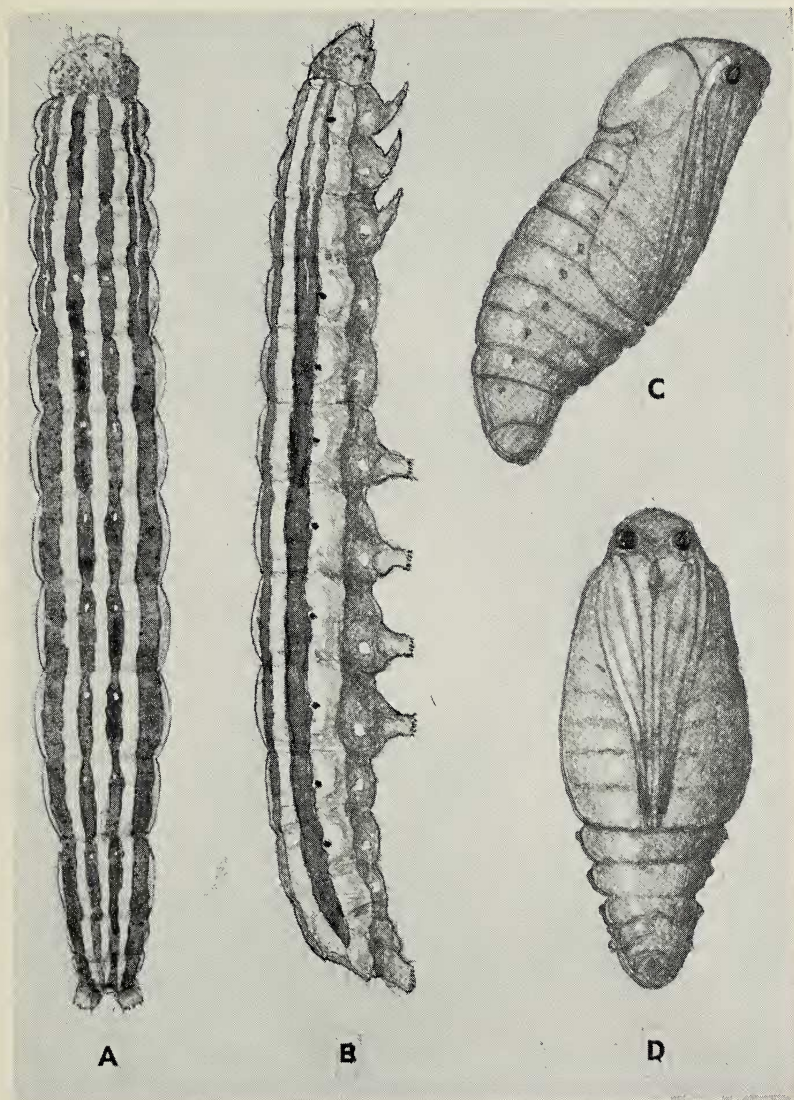


Fig. 7. Larva and pupa of *Annaphila evansi*. A. Mature larva, dorsal aspect, X 7. B. Mature larva, lateral aspect, X 10. C. Pupa, lateral aspect, X 10. D. Pupa, ventral aspect, X 10.

Reproduced from water color drawing by J. A. Comstock.

Unfortunately we have not been able to secure eggs, larvae or pupae of the species, all of which still need to be illustrated.

The type locality of *Annaphila evansi* Rindge and Smith is Mint Canyon, Los Angeles County. It has also been taken along the North Fork of Chilao Creek, Los Angeles County, and in Horse Flats, San Gabriel Mountains, Los Angeles County, elevation 5900 ft. Its period of flight is from March to May. The food plants are *Linanthus breviculus* Greene and *Gilia lutea* (Benth.). As it feeds only on the bracts and blossoms, it is a difficult larva to find in the field, in spite of its relatively conspicuous coloring as a mature larva.

The moth was named for William H. Evans, who reared it from eggs collected April 13, 1950. He described the third and fourth instars very briefly as "Light chalky green, with four dark green stripes." His notes on the mature larva were more detailed: "Ground color, chalky white; stripes dark green after molting, changing to reddish brown; dorsal stripe pale, geminate, rather narrow, bounded laterally by wider dark stripes running the length of the body; spiracular stripe wide, prominent, running the length of the body, extending well dorsad of spiracles, darkest along line of the spiracles."

It is to be regretted that he did not describe the egg or pupa.

A mature larva was taken in the San Gabriel Mountains. It had assumed the final coloration of "reddish brown" stripes before our illustration was undertaken. We can therefore supplement and amplify Evans' description, and follow up with notes and a drawing of the pupa.

*Mature larva:* (Fig. 7 A and B)

The ground color of the head is ivory, with a slight tinge of yellow. Over the crown there are multiple small pink dots. The "geminate" dorsal stripe is separated by a white stripe, and the two pinkish-brown stripes bordering it have white dots on each segment, except in the thoracic area.

The dorso-lateral longitudinal pinkish-brown stripe starts in the thoracic area as a geminate band, but continues the remainder of the way to the cauda as a single wide band. The wide stigmal white band bears the dark contrasting spiracles on its upper edge. The lower edge of this band becomes dull orange along its margin.

The area which is about in line with the bases of the prolegs marks a change in color to a dull pink, and then fades to a lighter shade on the venter. Above each leg and proleg, and resting on

the dull pink area there is a line of round white spots, one to each segment.

Our larva perished before we were able to record measurements, probably due to lack of fresh (and blooming) food plant.

Evans did not succeed in obtaining normal pupa, or observing the fact that pupation occurs underground in an oval cocoon. Mr. Henne was successful in this respect which makes possible the description and illustration of the pupa.

The cocoon measures 9 mm. x 3.4 mm. It is covered with granules of sand and soil.

*Pupa:* (Fig. 7 C and D)

Length, 6 mm.; greatest width through distal quarter of wing, 2.25 mm.

The color and texture of the body is predominantly glistening translucent yellow-green. The head is tinged with light reddish-brown, and the eyes are jet black. The segmental junctures are not darkened, and are hence difficult to distinguish, except for the tips of the antennae, which are slightly tinged with brown. The maxillae reach the wing margins and the antennae terminate slightly short thereof. The spiracles are minute, and tinged with brown. Because of the translucence of the wing covers, the segmental junctures show clearly through them. The caudal tip is rounded, and bears no projections, spurs or hooklets.

## REFERENCES

- DRAUDT, M. 1927. (In Seitz), *Macrolepidoptera of the World, American Noctuiiformes*. Vol. 7.
- EVANS, WILLIAM H. in RINDGE and SMITH. 1952. Revision of the Genus *Annaphila*. p. 247.
- HOLLAND, WILLIAM J. 1908. *The Moth Book*, Doubleday, Page & Co., N. Y. 479 pages, 48 col'd plates, 263 text figs.
- RINDGE, FREDERICK, and CLAUDE I. SMITH. 1952. A Revision of the Genus *Annaphila*, (Lepidopt. Phalaenae.) *Bull. Am. Mus. Nat'l. Hist.* Vol. 98: (Article 3), 187-256, 8 figs.